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AGRICULTURAL PRODUCTIVITY AND EUROPEAN INDUSTRIALIZATION, 1890-1980.

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Abstract

This exercise in comparative measurement and analysis surveys indicators for labour and land productivities in European agricultures between 1890 and 1980. It exposes the empirical flaws and above all the range of conceptual difficulties involved in defining agricultural outputs and inputs for purposes of international comparison. Yet the numbers do reveal how the industrialization of continental economies was constrained (and severely constrained in Mediterranean Europe) compared with that of the UK by malign historical legacies of high ratios of labour to land and an unfavourable ecological environment for the diffusion of the animal intensive technology of the first agrarian revolution.

Key words:
Labour and land productivity, purchasing power parity, land-labour ratios.

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I

"Why isn't European history the history of a continent?", William Parker asked recently. He went on to affirm that "if the study of Europan economic history is going to be of any use or interest, ... it is going to have to have a different format", and must become "a history of transnational trends and development in which the political units were set".[1] Few economic historians of Europe would disagree because they are persuaded by the idea that international comparisons help towards a better understanding of both European and national patterns of industrialization.[2] The virtual abandonment of a British paradigm represents another step forward for comparative economic history particularly when countries that failed to experienced significant structural change before 1914 are included in the selection of cases studied in the context of European economic history.[3] But progress in comparative history remains limited in coverage and scope. Most texts continue to embody little more than summaries of national economic histories, while older typologies which purport to include Europe as a whole in a unified and integrated frame of reference are regarded as unsatisfactory.[4]

In order to measure and to explain the gap in levels of income per capita and output per worker across European countries, a larger and more secure data base is required, especially for agriculture because early and successful examples of industrialization in Europe have been closely associated with improvements in the productivity of land, labour and capital employed in primary productions. Benign connections between high and increasing levels of agrarian productivity and the rise of an urban industrial economy are well understood. The problem now is to locate, measure and explain contrasts in the performance of national agricultures across Europe, first at a point in time and then through time. As a contribution to that discussion we purpose to estimate and analyse differences in the productivity of labour and land utilized by the agricultural sectors of five

major European economies for a run of five years around 1910 and then to offer an account of the convergence and divergence in productivity levels between 1890 and 1980. Alas data available on agrarian capital formation is simply not adequate or accurate enough to compare levels and charges in total factor productivity and our analysis falls back on the range of possible inferences that might be drawn from the measurement and careful testing on partial productivity indicators.(5).

New benchmark estimates for the productivity of labour and land utilized in producing French, German, Italian, Spanish and U.K. agricultural outputs have been constructed for years before the Great War. Comparable estimates compiled by other scholars for that year and for benchmarks around 1930, 1960, 1970, 1975 and 1980 have been used for two purposes: first to analyse trends towards convergence in agrarian productivity over time; secondly (and of equal importance) to expose the meaning, limitations and consistency of the range of estimates now available for the measurement of output per worker and yields per hectare across European agricultures. Many numbers appear in print purporting to represent partial productivity levels for agriculture (and also for industry). Their empirical validity needs to be properly established and their meaning carefully specified if we are to initiate discussions about contrasts in performance across Europe based upon a data base that analytical economic history can take to be reasonably secure.(6) Thus, we propose: to present a new set of output and productivity estimates for 1910 in Section II; to critically survey figures and methods published by other authors for the measurement of output and productivity for that same period (Section III); to discuss the historical inferences about European development that might be drawn both from cross country comparisons for 1910 and from longer term trends towards convergence in agrarian productivity from 1890 to 1980 (Section IV).

II

In order to estimate levels of agricultural output and productivity in comparable units of account across five European countries for years around 1910, we followed the procedures adopted and explained by van Ooststroom and Maddison and by O'Brien and Toniolo.[7] We began by constructing final agricultural outputs (final outputs which are measured in physical quantities produced net of seed, animal feed and wastage) for U.K., France, Germany, Italy and Spain. Final outputs for most of the crops and animal products produced by all five national agricultures were multiplied by two sets of farm gate prices, or by 'shadow' prices wherever farm fate prices were not available. As a first step we derived estimates for aggregate final output of each nation's agriculture valued both in sterling and in the nation's own currency.

Forestry is omitted because data is inadequate and manufactured dairy products (cheese and butter) were defined as industrial outputs and excluded from agricultural production. Farm products were assumed to be homogeneous and comparable across countries and variations in quality or fine differences in classification are thereby ignored. In theory and largely in practice the prices used to value physical outputs were prices paid to farmers. Where price quotations could not be traced shadow prices were constructed for particular crops (usually Mediterranean foodstuffs) by using Italian (and in some cases Spanish) price ratios relative to wheat. Occasionally import prices (net of freight, insurance and other distribution costs) also served as shadow process.[8]

Sources for the U.K., France and Germany are those used by other scholars in European economic history, namely the original research of Ojala, Mitchell and Deane, Dewey, Toutain and Hoffmann.[9] While the recent and still unpublished research of Federico and of Simpson provided improved information for the outputs of Italy and Spain.[10]

For our second set of calculations designed to produce rather rough estimates of gross value added (i. e. the aggregated values of final outputs minus the values of the inputs of goods and services purchased from outside agriculture) we accepted the percentages offered by Vandellós for Spain, Federico for Italy, Hoffmann et al. for Germany, Toutain for France, Ojala (cross checked against unpublished estimates by Kennedy) for U.K.[11]

In order to maintain consistency with other published estimates for labour productivity we have not followed the O'Brien and Toniolo procedures of defining the labour input in terms of fully employed male equivalent units of labour time. Their complex method attempted to eliminate man years of unemployment from census reports of labour available for works in agriculture and to convert the labour of the elderly and of women and children into male equivalents units of labour input.[12]

Their theoretically preferable solution could not be adopted for multinational comparisons because of the inconsistencies discovered in reporting female agricultural workers by national population censuses and the research required to measure under and unemployment among agricultural work forces across Europe would be extremely difficult and possibly futile to undertake. Finally (outside Britain) the division of labour between agriculture, industry and services had still not proceeded far enough by 1910 to countervail a considerable (but unmeasurable) degree of arbitrary assignment of workers by census officials to single sectors of a rapidly evolving but still rather unspecialized structure of occupations.[13] For instance, it is possible to divide the working year of any given 'labourer' between time spent engaged in farming (agriculture), carting produce for sale in urban markets (services) and manufacturing clogs (industry). In practice the officials who recorded his occupations for a population census usually classified him in terms of his principal occupation -i.e. as an agricultural labourer.[14] This implies that for economies with less refined

divisions of labour (e.g. Spain and Italy compared with the U.K. and Germany) the estimates available in population censuses on the size of work force engaged in agriculture are likely to be overstated and the figures for their labour productivities are understated. Our labour input figures refer either to males classified as employed in agriculture or to totals of economically active populations assigned to agriculture. Thus the figures depend heavily on population censuses with their all too familiar imperfections. [15]

Measuring the input of land utilized to produce total agricultural outputs turns out to be even more problematical. Variations in quality for different kinds of soil contained within the boundaries of European states makes aggregation into hectares of cultivated land questionable. Although arable land may be more similar in quality than 'total agricultural land' which includes pastures, meadows, rough grazing and other types of land used to support animals and 'wild' fruit and nut trees. Some authors were prepared to make the assumption that arable land is homogeneous and transformed other land into arable equivalents, using unexplained conversion coefficients. This method is analogous to the conversion of 'other' workers into full time male equivalents adapted for the labour input by O'Brien and Toniolo. Alas we could not be satisfied that conversion coefficients (adopted by Moore and Dennison) could be validated empirically.[16] Futhermore, in mixed farming systems it is extremely difficult at the macro level to separate out the hectares of arable land used to feed livestock. We adopted a solution which also offered the advantage of allowing us to compare aggregated yields per hectare over time by using the estimates published by other authors for 1930, 1960, 1970, 1975 and 1980. Our land inputs (which rest upon standard F.A.O. definitions) refer: to total agricultural land which is an inclusive concept embodying arable land plus permanent pastures and meadows as well as rough and mountain grazing.[17]

Table 1. Labour Productivity in European Agriculture c. 1910

(U.K. = 100)

	Final Outputs		Values Added	Gross
France	O/L	O/LM	O/L	O/LM
1. Direct Estimates				
O'Brien-Prados de la Escosura (U.K. prices)	58	86	76	114
O'Brien-Prados de la Escosura (French prices)	57	85	75	112
Bairoch (calories)		72		
Van Zanden (wheat equivalents)	56	83		
O'Brien-Keyder (PPP)			67	
2. Backward Extrapolations				
Moore (European crop units for 1930)	55	82	53	79
Hayami Ruttan (international wheat equivalents for 1960)		52		
O'Brien- Prados de la Escosura (1960 US prices)	55	82		
Van der Meer and van Ark (1975 US prices)			74	
Prasada Rao (1975 international prices)	58	86	39	58
Germany				
1. Direct Estimates				
O'Brien-Prados de la Escosura (U.K. prices)	56	97	77	134
O'Brien-Prados de la Escosura (German prices)	58	100	79	136
Bairoch (calories)		106		
Van Zanden (wheat equivalents)	77	133		
Fremdling (PPP)			51	
2. Backward Extrapolations				
Moore (European crop units for 1930)	71	123	70	122
Hayami Ruttan (international wheat equivalents for 1960)		74		
O'Brien-Prados de la Escosura (1960 US prices)	68	118		
Van der Meer and van Ark (1975 US prices)			118	
Prasada Rao (1975 international prices)	76	132	64	112
Italy				
1. Direct Estimates				
O'Brien-Prados de la Escosura (U.K. prices)	31	47	43	65
O'Brien-Prados de la Escosura (Italian prices)	30	45	41	62
O'Brien-Toniolo (U.K. prices)		43		60
O'Brien-Toniolo (Italian prices)		46		65
Bairoch (calories)		28		
Van Zanden (wheat equivalents)	24	37		
2. Backward Extrapolations				
Moore (European crop units for 1930)	26	40	36	55
O'Brien-Prados de la Escosura (1960 US prices)	30	45		
Prasada Rao (international 1975 prices)	36	54	35	53
Spain				
1. Direct Estimates				
O'Brien-Prados de la Escosura (U.K. prices)	31	32	44	45
O'Brien-Prados de la Escosura (Spanish prices)	24	25	35	35
Bairoch (calories)		36		
Van Zanden (wheat equivalents)	31	32		
2. Backward Extrapolations				
Moore (European crop units for 1930)	41	42	57	58
O'Brien-Prados de la Escosura (1960 US prices)	32	32		
Prasada Rao (international 1975 prices)	31	31	34	34

Notes and Sources O/L, output per worker; O/LM, output per male worker.

1. Direct Estimates:
O'Brien and Prados d la Escosura, Appendix A, Tables A.1, A.2 and A.3.
Bairoch 'Niveaux de developpement'.
Van Zanden, 'The first green revolution' and companion working paper under the same title. Van Zanden's total gross outputs include animal feed and seed. In order to maintain consistency with other estimates we preferred to use our own concepts of labour inputs (i.e. total and male workers employed in agriculture). Van Zanden's concept refers to the total number of persons dependent upon agriculture.
O'Brien and Keyder, Economic growth. Their PPP rate for agriculture is very narrowly based and the comparison refers to G.B. and not to U.K. - which overstates French backwardness compared to U.K.
O'Brien and Toniolo, 'The poverty of Italy'.
Fremdling, 'Productivity comparisons'. Fremdling's PPP rates are based upon larger samples of prices than the PPP rates estimated by O'Brien and Keyder for France and Britain. His ratios refer to Britain and overstate German backwardness compared to U.K.

2.Backward Extrapolations (with real output indices cited in Appendix A, sources for table 6).

Moore, Economic demography.
Hayami and Ruttan, Agricultural development. International wheat equivalents are an average based upon the relative agricultural prices compared to wheat in USA, Japan and India.
O'Brien-Prados de la Escosura, 'Agricultural productivity'. We utilized data in Hayami-Ruttan, Agricultural development to construct estimates in US prices for 1960 and extrapolated the outputs backwards to 1910 with real output indices cited in Appendix A.(sources for table 6).
Van der Meer and van Ark, 'Growth and productivity'. These estimates are extrapolated from end year (1975) output data in Van Ooststroom and Maddison 'An International comparison', which are expressed in 1975 US prices.
Prasada Rao, 'International comparisons'. International prices or international dollars are explained in the text.

We present direct estimates of the productivity of labour and land employed in French, German, Italian and Spanish agriculture compared to the U.K. for years around 1910 in Panel 1 of Table 1 below. Two concepts of output (final output and gross value added) are represented in the numerator and two definitions of labour input (male workers and all agricultural workers) have been used to calculate the productivity ratios which are measured in current prices and referred for comparisons to the United Kingdom, expressed as 100.

Given the quantity and the quality of data available this approach to the calculation of productivity ratios is the preferred method on theoretical grounds. It is also amenable to expression in simple language. But several scholars engaged in similar exercises have adopted other approaches -usually as a convenient device for avoiding the time consuming research involved in finding and calibrating the data for the current prices and quantities of crops and animal products produced by national agricultural sectors across Europe for decades when statistics are scarce, and subject to higher degrees of error than is tolerable today. Their methods, however, also offer historians useful ways of estimating productivity ratios for the periods in the past when direct information is not available.

III

Before analysing the inferences that flow from calculations in Table 1 it is necessary, therefore, (a) to check our new 'best practice' figures against the productivity ratios already published or implicit in the work of other scholars; (b) to account for discrepancies between them; (c) to explain the surprising similarity in the range of estimates thrown up by two very different methods used to compile and compare standards of productivity achieved by national agricultures during the first decade of this century. We propose to concentrate upon variations in productivity ratios that are basically generated by the procedures used to measure <u>outputs</u> for 1910 and to virtually ignore variations produced by different conventions adapted to define and to measure <u>labour and land</u> inputs. In fact for purposes of consistency we applied our preferred concept of labour input (total and male labour force employed) to van Zanden's output data for 1910. Furthermore it is also germane to observe that the results obtained by O'Brien-Toniolo for the productivity of labour employed in Italian compared to U.K. agriculture are entirely congruent with our results based upon a less problematical definition of the labour input as male workers employed in agriculture.

Two distinct approaches mark the work of other scholars who have estimated agrarian outputs in comparable units of account for 1910. The first or 'direct method' begins with the available figures (or sub-sets of figures) for final outputs crop by crop, product by product and converts the data expressed in physical units into calories in one example and into wheat equivalents in the other.

The second or indirect method (which is now becoming standard practice among economic historians concerned to estimate differentials in expenditures or incomes per capita over the long run) is to accept the differentials already measured in international dollars, U.S. dollars, wheat equivalents or some other standard for a contemporary year (1960, 1970, 1975, 1980, 1985) and to extrapolate the results back in time using indices constructed for the measurement of growth in real incomes, outputs, populations and workforces over spans of years going back to the late nineteenth century and in some examples as far as the early eighteenth century.[18]

First we consider two alternative sets of direct estimates for 1910. Bairoch's productivity ratios which are based upon the conversion of large samples of agrarian products into calories are conceptually flawed because consumers do not buy calories.[19] Empirically when compared to our direct estimates Bairoch's method leads to biases that emerge as unpredictable in direction and variable in magnitude.

Van Zanden's exercise which converts final outputs to 'wheat equivalents' based upon relative international prices for wheat circa 1910 compared to other items of agricultural produce is clearly preferable on empirical grounds but is still a theoretically questionable method of measuring national agricultural outputs and relative productivity levels. [20] Even in 1910 international markets were far from perfect and farmers continued to allocate resources in relation to national and even to local price structures. Conceptually, the meaning of national

farm outputs expressed in international price relatives is far from clear. In a literal sense the numbers provide an indication of the aggregated value of a given national agricultural output that would in theory have been realized by farmers working within the boundaries of a European state, if they had sold their produce at a set of relative prices established on international markets. Of course if European farmers en bloc had in practice attempted to offload their produce onto world markets that set of relative prices would have changed and perhaps radically. Although national price structures (particularly for basic arable products such as grain) were becoming increasingly embedded within international markets, divergences varied by crop, by country and by region. Location, transportation, information flows, climatic and technical possibilities as well as agrarian tariffs all influenced choices faced by farmers. International trade and prices certainly impinged on their decisions but to a degree that varied significantly from place to place within Europe.[21] Thus any exercise which converts a particular selection of crops produced, for example, by Andalucian farmers, into wheat equivalents based upon international price relatives for 1910 is likely to generate numbers of ambiguous meaning when used as a base for the analysis of relative agricultural efficiency across Europe's economies and regions.[22] While Van Zanden's estimates of labour productivity and relative levels of income received by agricultural populations across Europe fall into line with our results, his output figures seem far too optimistic for Germany and are surely too pessimistic for Italy.

Another familiar way of circumventing the real difficulties involved in tracing sufficient quantity and price data to conduct multinational comparisons crop by crop, country by country, is to construct purchasing power parity rates of exchange. Here the objective is still to convert available measures for the values of total agricultural outputs (final outputs and gross values added) expressed in one currency into another. For familiar reasons the accessible quotations of rates of exchange established through trade and capital flows across national

borders are thought to generate biased results. The alternative (and theoretically acceptable) solution is to construct 'purchasing power parity' (PPP) rates of exchange based upon representative samples of agricultural commodities produced in any two countries under comparison. For this purpose each national sample should contain quantities of farm produce weighted in proportion to their significance within the aggregated value of national agricultural production. Each basket is then priced first in domestic and then in foreign currency and rates of exchange (e.g. the sterling value of a 'representative' basket of agrarian produce costing 100 francs to buy from farmers in France) are then easily calculated. Provided the samples of farm produce are properly weighted and representative and that foreign prices for equivalent national products are ascertainable, PPPs should provide an acceptable substitute for the time consuming procedure of converting the value of one nation's agricultural outputs into another, commodity by commodity, price by price.

Difficulties arise because the sample of crops and animal produce included in such baskets may not adequately represent missing components of agricultural production; because foreign prices may not exist for important but nationally specific crops and because shadow or proxy prices for these unique crops may bias the exchange rates in unknown directions. In short the method works best for agricultures producing a comparable mix of produce. To exemplify this point we have presented the PPP rates implicit in our set of bilateral comparisons of final agricultural outputs across European economies for 1910. We propose to contrast these comprehensive calculations first with trading rates of exchange and then with other published estimates based upon representative sampling which offer agricultural and overall PPP rates for sterling and francs for sterling and marks.

Table 2 exposes the margins of error that would follow from coverting Spanish, Italian, French and German agricultural outputs into sterling at trading rates of exchange. We observe

that the degree of overestimation could be considerable for Spain and Italy, less significant for France and hardly important for Germany. In all trading rates of exchange for 1910 are not badly out of line with the true PPP rates that we have established for all agricultural products. Indeed trading rates are closer to rates for the agricultural sector than economy wide PPP rates estimated by O'Brien and Keyder and by Fremdling for francs and sterling and for marks and sterling respectively. Their overall PPP rates not only fall below trading rates but deviate from our comprehensively estimated PPP rates for primary production alone by margins that would lead to definite understatements of French and German agricultural outputs converted to sterling on these coefficients.

Table 2. Trading and Purchasing Power Parity (PPP) Exchange Rates with Sterling for Five European Currencies c. 1910

	Agricultural PPP rates		Trading Exchange Rates	Overall PPP Rates
	Weighted by the nation's output	Weighted by British output		
Pesetas per £[a]	27	35	27	-
Lire per £[a]	29 (35)[b]	30 (32)[b]	25[e]	-
France per £[a]	27 (29)[c]	27 (27)[c]	25[e]	29[e]
Marks per £[a]	22 (30)[d]	21 (30)[d]	20[d]	25[d]

Sources. (a) Appendix A, Table A.3.
(b) O'Brien and Toniolo, 'The poverty of Italy'.
(c) O'Brien and Keyder, Economic growth in Britain and France.
(d) Fremdling, 'Productivity comparisons'.
(e) Statistical abstract for the principal and other foreign countries.

These comparisons also reveal that all estimates for PPP rates of exchange are indeed sensitive to sample size and to the quality of the data used in their construction. For example the lire-sterling rates implicit in the O'Brien-Toniolo comparisons of Anglo-Italian agrarian outputs are based upon comprehensive

samples but they also rest on older and less reliable produce, price and labour force date than those used here, and produce downward biased estimates of Italian output duly converted into sterling of 18 per cent on Italian weights and 6 per cent on U.K. price weights. The O'Brien-Keyder and the Fremdling PPP rates based on tiny and unrepresentative samples of agrarian produce generate conversion ratios which lead to the underestimation of French and German agricultural outputs compared to U.K. by the least 8 per cent on French price weights in the first case and around 33 per cent in the case of Germany, regardless of price weights.

For productivity comparisons comprehensive coverage is the preferred method and PPP conversion rates based on sampling should be subjected to sensitivity tests. As Tables 1 and 2 reveal previous conversions of the outputs (gross values added) of the French and German agricultural sectors into sterling equivalents at specially constructed PPP rates have produced estimates of labour productivity levels that could be discernibly understated for France and much more seriously underestimated for Germany. Given that in 1910 the agrarian sectors of France and Germany employed far larger shares of the workforce than the U.K., this finding implies that overall productivity gaps (output per man year worked) and implicitly differentials in income per head between the three European economies may well be narrower than established estimates suggest.[23] Perhaps the size of these gaps can only be securely established by converting European outputs into sterling sector by sector utilizing a carefully constructed set of PPP exchange rates.

Several authors have offered productivity estimates for 1910 based upon the alternative indirect and short cut method of backward extrapolation from available and presumably accurate modern estimates. In this context Moore's report to the League of Nations published as long ago as 1945 may be considered innovative. Moore computed 'final physical outputs' for a set of European countries averaged over the years 1931-35. He then

weighted each country's products by a set of 'modal value ratios' or 'European wide' relative prices to provide a comparable tabulation of final outputs expressed in what he called 'European crop units'.[24] Moore's pioneering work anticipates methods suggested by Geary in 1958 and developed further by the United Nations International Comparisons Project (ICP) running from 1970 to date. Their procedures are designed to convert national expenditures and outputs valued in national currencies into an invariant and transitive standard called 'international dollars'.[25] International dollars (which are widely used by economists to estimate variations in levels of per capita income across countries for benchmark years after 1960 and latterly by economic historians to track changes in per capita income differentials through time) are difficult to define in simple language, and for purposes of cross country comparisons of productivity levels this method remains theoretically controversial.[26] Basically and in an agrarian context the adaptation of the method by Prasada Rao involved pricing grains, meat, dairy produce, fruit, vegetables and other farm produce in ratio to farm gate dollar prices prevailing in the numeraire country, the United States. Such prices in dollars for very long lists of farm produce were then transformed into weighted average prices. The weights utilized were proportionate to the share of a given country in world production for a given output. Prasada Rao's standardized estimates for the values of final outputs and gross values added expressed in international dollars for 1975 were extrapolated back to 1910 using established indices available to measure growth of real agricultural production between these two end years.[27] For 1960 output estimates have been published in the form of international wheat equivalents for France and Germany by Hayami and Ruttan and Ruttan and Yamada.[28] Their methods involved pricing all final outputs expressed in physical units in three sets of farm gate relative prices - relative, that is, to wheat prices prevailing in the United States, India and Japan. The resulting aggregates were related to the period 1957-62, then averaged geometrically to produce comparable indicators of final agricultural outputs for years

circa 1960 which were then extrapolated backwards to 1880 using indices designed to record changes in real output over the intervening years. Unfortunately, and as Table 1 shows, the results for purposes of comparing French and German productivity levels with U.K. for 1910 do not correlate at all well with our preferred direct methods and can be rejected for Europe.

On the other hand backward extrapolation of final outputs based upon end year conversions using US prices for 1960 generate productivity ratios that fall broadly into line with our own direct and comprehensive calculations of labour productivities for 1910. To be more specific: Table 1 shows that this indirect method offers reasonable predictions for French, Italian and Spanish productivity levels in 1910; but for reasons that are not clear suggests unacceptably high predictions for levels of agricultural productivity prevailing in Germany before the First World War.[29]

The use of end year estimates in European crop units for 1930 or in international dollars for 1975 to make plausible suggestions about levels of agrarian productivity for purposes of historical analysis cannot be recommended with quite the same degree of confidence. Table 1 reveals that such 'predictions' for Germany are again particularly suspect. Although predictions of productivities for France, Italy and Spain based upon ratios of final outputs per worker available or per male worker employed by these three national agricultural sectors do fall broadly into line with our direct estimates for 1910.

Alas unacceptable discrepancies in both directions appear among all the predictions of gross values added per male or per person employed in European agriculture. This is unfortunate because value added per unit of labour input is a far more illuminating index of productivity to contemplate for purposes of historical analysis. Furthermore, our own direct estimates for 1910 are vulnerable to the 'guesstimates' made in the original research related to the proportions of final outputs

that represent purchases of industrial inputs and services from outside agriculture. Between 1910 and 1975 that proportion converged towards the advanced agrarian sector found in the United Kingdom. Thus the growth of French, German, Italian and Spanish agrarian production measured as deflated gross value added will proceed at a slower rate than growth measured in terms of increases to the volume of final outputs. Backward extrapolations from 1960 and 1975 using standard indices which are normally designed to measure changes through time in final outputs embody a downward bias. This means that the relative productivity estimates for 1910 produced by indirect methods overstate the gaps between the advanced agriculture of the United kingdom and its more backward neighbours on the mainland. All in all our comparisons suggest that available and potentially useful indirect methods seem more secure for predictions based upon 1960 US prices and upon final outputs than upon 1975 international dollars or gross values added.

In theoretical terms backward projection of modern productivity ratios could produce increasingly indeterminate results as we move through time. First the initial or base line ratios (expressed in wheat equivalents, US prices or international dollars) are not merely subject to errors that flow even from modern day differences in the quality of national agrarian statistics for quantities, prices, labour and land inputs, but their status as indicators of relative levels of national efficiency remain ambiguous. As late as 1975 the agrarian price structures to which farmers responded across Europe were still some distance from a subset of competitively formed international prices. Europe's farmers cannot be meaningfully depicted as engaged in the allocation of land and labour in relation to American price relatives or by implication to that even more abstract set of prices - international dollars. Transforming national farm outputs (even for purposes of comparison) into numeraires that only imperfectly reflects decisions taken by farmers introduces indeterminate degrees of bias even into modern estimates designed to facilitate

comparisons across Europe. Such biases could moreover be compounded by the theoretical and empirical imperfections already built into the official or acceptable indices of real output utilized for backward projections to 1910, particularly for those national agricultural sectors undergoing radical transformations in crop mix and patterns of relative prices over time. As Table 3 shows the structure of European agricultures differed rather markedly in 1910 not only between Mediterranean regions (Spain and Italy) on the one hand and the north-west (U.K. and Germany) on the other, but also in the proportions of final outputs obtained from animal compared to arable agriculture. Over the twentieth century the animal intensity of European agriculture converged at very different speeds towards the United Kingdom pattern.

Table 3. Composition of Agricultural Final Output in Five European Countries c. 1910 (Valued in national currencies) (percentages).

	France	Germany	Italy	Spain	U.K.
Cereals	22.2	18.6	20.9	31.4	11.0
Pulses	0.8	0.3	1.3	3.3	0.7
Vegetables	4.8	8.1	7.2	11.8	6.7
Raw Materials	3.4	4.7	5.8	3.4	2.9
Fruits, Nuts	11.7	1.6	9.0	6.9	2.4
Wines (Must)	12.5	1.1	22.4	6.9	0.0
Olives	0.2	0.0	4.6	6.0	0.0
Pasture	0.0	0.0	0.0	0.0	3.3
Meat	22.2	34.6	13.1	17.4	42.7
Poultry, Eggs	9.3	3.6	7.4	4.8	6.0
Milk	12.9	27.1	7.8	8.0	23.2
Other	0.0	0.3	0.0	0.1	1.1
Non-animal	54.9	33.7	68.1	68.3	25.3
Animal	45.1	66.3	31.9	31.7	74.7

Sources: Appendix A, Table A.4.

Critics of backward projection also point to the familiar and formidable index problems involved in this method particularly when shares of production covered, and when relative prices and the composition of national outputs change through time. Their theoretically sound objections could turn out to be entirely valid for industry, for services and by extension for

GDP and per capita incomes as a whole. Only comparisons between estimates obtained by both direct and indirect methods will expose the potential margins of error implicit in using short cuts and theoretically debateable methods to devise potentially useful and quantified perceptions about the past from available and more accurate information about the present.(30)

Nevertheless tests of the kind conducted here for relative levels of agricultural income and productivity across Europe suggest that backward projections produce some useable results for historians for that particular sector. Our confidence in ratios so obtained for European agricultures for 1910 is not however extendable by implication to industry, services and national income because we suspect that changes in product mix and relative prices even over the medium run of some five to seven decades involved in these exercises in backward extrapolation were far more profound outside than within the agricultural sector.

IV

For our historical analysis we begin with the situation before the First World War and for reasons already expounded propose to base our initial comments upon direct estimates in U.K. prices for 1910. Table 1 shows that the variation between labour productivity indicators estimated in either U.K. or national prices is narrow except for Spain, where gaps are of the order 21 to 25 per cent. For simplicity we can safely refer to estimates in U.K. prices and there is no need to present the estimates for land productivity (Table 4) in two sets of prices. Presumably the wider differential exposed for Spain reflects the weaker degree to which Spanish agriculture had become integrated into European and international trade over the nineteenth century. Alternatively it tells us something about the possible scale of medium term and adverse effects that flowed from tariff and exchange rate barriers erected by the Spanish government

against imported farm produce.[31] Conversely the small gaps exposed in Table 1 between valuations in U.K. and domestic prices for the other three continental economies suggest that the overall size of such macroeconomic effects emanating from similar attempts by the French, Italian and German governments to protect their farmers from American and Russian grain imports could only have represented small percentages of agricultural output and a far smaller share of their national incomes.[32] Bairoch has published an argument that positive effects on European economies flowed from the return to protectionism in the last quarter of the nineteenth century but his case (based on correlations between increased tariffs and growth rates) is not convincing.[33] Some degree of misallocation occurred within agriculture and between agriculture and other sectors of these four economies. For example free trade by depressing the relative level of agricultural prices could have forced labour to migrate to towns and to the Americas. Furthermore the shares of grain in total agricultural outputs measured in U.K. prices are discernibly lower than the shares in domestic prices as set out in Table 3.[34] Apart from Spain the narrow spread exposed in Table 1 between agricultural outputs measured in domestic or U.K. prices weakens arguments by liberals at the time and by economic historians writing today that significant losses flowed from the erection of tariff barriers against American and Russian grain in the late nineteenth century.[35]

Nothing surprising emerges from the rank order of labour incomes and labour productivity across European agricultures. By 1910 France and Germany had managed to reallocate a greater share of their workforces and populations into jobs outside agriculture than Italy and Spain. Over the long nineteenth century the two Mediterranean economies experienced more rapid rates of external migration than Germany or France but their towns and industries had not developed rapidly enough to pull a large enough share of underemployed labour from the countryside. Over the longer run the retention of substantial but largely redundant populations and workforces in Spain and Italy (and by

extension in other rural economies) depressed output per worker employed in farming and restrained the growth of rural per capita incomes for a majority of those European populations who continued to be attached to the land. As late as 1910 industrialization, urbanization within and migration beyond the borders of Italy and Spain had only managed to raise rural incomes (O/L) to something close to a third of comparable U.K. levels. While the agricultural populations of France and Germany enjoyed standards of living that probably approached 60% of those levels.

Productivity gaps measured in terms of an inclusive difinition of the agricultural workforce (O/L) and based upon the occupational categories adopted by demographic censuses (which were after all designed to enumerate and classify national populations basically for military purposes) are misleading as indicators of relative efficiency. As we suggest above such indices are best utilized as proxies for relative standards of living among Europe's rural populations. When agricultural outputs are divided by the more accessible and comparable index of labour inputs - namely by male workers employed (O/LM) - the productivity gap (and impressions of relative backwardness) narrows significantly for France and Italy, all but disappears for Germany but remains intact and wide for Spain. Given the insoluble problems involved in defining and measuring the total amount of labour <u>time</u> actually utilized by national agricultural sectors to produce outputs across Europe, we suggest that discussions of productivity differentials could be more securely based upon ratios that utilize numbers of male workers employed as their denominator.[36]

A table of agrarian productivity ratios for decades towards the early stages of European industrialization would be entirely illuminating to analyze. Unfortunately our data begins in 1890 when the agricultures of Germany and France had caught up with the first industrial nation but when the Mediteranean economies of Italy and above all of Spain still had a long way to go.

Agrarian historians now appreciate why the physical yields per hectare of grains, pulses and several other arable crops as well as the outputs of animal products per unit of foodstuffs have varied systematically across Europe's geographical regions.[37] At given ranges of agronomic knowledge and techniques available to raise arable and animal produce, for centuries those unlucky European farmers compelled to cultivate the soils and to cope with the climates and elevations of Italy, Iberia and Southern France found themselves at a disadvantage compared to better endowed farmers working the land of western Europe.[38] Until a wider set of agrarian technologies came on stream rather late in the nineteenth century, Mediterranean yields per hectare for grains and animal products could not be expected to approach the average standards achieved by the United Kingdom, the Netherlands, Northern France and large parts of the German plain. For Italy and Spain, and similarly endowed countries, the hard facts of place and climate set limits for potential levels of output and productivities per worker, employed in agriculture.[39]

Furthermore, and (with the exception of Spain) our estimates of relative levels of land productivity (again measured in pounds sterling) do not lend support to the familiar criticism that over the nineteenth century continental agricultures suffered from serious allocative inefficiencies, institutional failures or political obstacles which reduced total agricultural production substantially below optimal levels.[40] On the contrary the evidence for the productivity of land in 1910 indicates that the peasantries of Germany, France and Italy obtained higher average levels of returns per hectare than the farmers of Britain and Ireland (Table 4).

Table 4. The Productivity of Land Used in European Agricultures c. 1910 (U.K. = 100)

	Final Outputs (in U.K. Prices of 1910)	Gross Value Added (U.K. Prices for 1910)	Land-Labour Ratios (Compared to U.K.) Per Worker	Per Male Worker
France	143	188	41	60
Germany	168	230	33	58
Italy	165	231	19	28
Spain	54	77	58	59
Denmark	-	-	53	73
Netherlands	-	-	38	39

Sources: France, Germany, Italy, Spain and the U.K., Appendix A, Table A.1; Denmark and the Netherlands, Table 5.

Alas 1910 (selected simply because reasonable data happens to be available) represents both a base and a final year for the analysis pursued here. Nevertheless, some agrarian historians tend to argue (without the sort of numbers tabulated above to support their suggestions) that differentials in revenues per hectare favoured the progressive English agriculture, already in the eighteenth century. Comparable productivity data for benchmark years earlier than 1910 are certainly required to measure these margins. Meanwhile there is no need to assume that European land (as well as European labour) productivities fell below U.K. levels for long stretches of time before the early twentieth century.

Our data and this comment does not imply that only very limited increments to total output might have been secured either by the reallocation of land to more valuable or higher yielding crops, or through reforms to tenurial institutions, or alternatively by changes to governmental policies, and particularly to the tariffs created to protect most European (but not British) farmers from American competition from 1873 onwards. Rather what this data set does is to qualify arguments which begin from the premise that the relative backwardness of European agricultures can be explained in any large degree by contrast between efficient and less efficient agrarian organizations, favourable and unfavourable governmental policies and from

presumed failures to diffuse 'English practices' onto the mainland. Final outputs per unit of land utilized to cultivate crops and rear animals may in general and over long periods of time have been higher in several European regions[41] Furthermore the differences with U.K. agriculture as measured albeit on this one indicator is even more pronounced for gross value added.

Table 5. Land:Labour Ratios in European and American Agricultures (Total Arable Hectares Cultivated Plus Land Used for Pasture per Male Worker Employed)

	France	Germany	Italy	Spain	UK*	USA	Denmark	Netherlands
1890	6.0	6.4	3.3	6.9	10.7	39.2	6.3	5.0
1910	6.9	6.6	3.2	6.7	11.4	44.1	8.3	4.4
1930	7.9	6.5	3.3	8.9	13.6	48.7	8.2	4.4
1950	10.2	6.8	3.3	6.6	16.0	70.7	9.2	4.3
1960	13.0	9.1	4.3	8.3	20.8	117.0	10.1	6.0
1970	17.6	14.3	6.9	13.0	28.5	168.7	17.2	6.5
1975	21.0	14.2	8.1	16.4	31.9	202.4	22.1	6.8
1980	24.9	18.8	9.6	20.9	35.0	246.6	23.5	7.7

Sources: Appendix A.

*Note: Pre 1926 UK, that is, today's U.K. plus Eire.

European farmers (including the Dutch and the Danes) continued to operate with significantly lower ratios of land to labour than British farmers. They had (as economic theory predicts and as our data now verifies) used their abundant resource, labour, to intensify the cultivation of land and to maximise monetary returns per hectare cultivated or used for animal husbandry. With so much underemployed and family labour time at their disposal they had not proceeded nearly as far as British farmers in purchasing agricultural inputs (machinery, tools, fertilizers, chemicals and power) and urban services (transportation, distribution, and financial assistance) from specialized industrial and service sectors. Their rational economic interest in performing services for themselves and in finding substitutes on the farm for the urban services and industrial inputs purchased by British farmers can, moreover, be measured in terms of the relative ratios of gross values added to final outputs. Compared to the U.K. where a ratio of

approximately 67 per cent indicates just how much further specialization across the sectors had proceeded by 1910, the ratio for France comes to 88, for Germany 92, Italy 93 and Spain 95 per cent.[42]

To sum up: our perceptions (based upon comparisons at this macro level across five major European countries are as follows: at given levels of technology, by 1910 (and possibly decades before that) the potential for raising output per worker, per hectare and the incomes of continental populations dependant on agriculture seem rather limited. Mainland European economies could only develop and converge towards U.K. standards of agrarian productivity (and by implications to its overall level of income per capita) by radical shifts in the allocation of labour away from primary production. That shift occurred at a rapid but far from steady rate over this century when all European economies ran down shares of their workforces producing agricultural outputs to mere fractions of the proportions still on the land in 1910.[43]

Further historical perspective on the significance of the agricultural base for Europe's long transition to urban industrial economies can also be derived by tracking that process from the late nineteenth through the late twentieth century. Our preferred method would be to chart structural change statistically by constructing benchmark estimates for land and labour productivities, in U.K. and in 'other' countries prices, decade by decade. Unfortunately the research required to make these numbers is beyond our capacities. Instead we fall back upon the indirect and short cut method of backward extrapolation from end year estimates of outputs expressed in United States prices for 1960. Our caveats and reservations about this device have been enunciated but we have also observed that backward extrapolation based on United States prices for 1960 predict relative productivities, for 1910, rather accurately. Furthermore, we have also compared the ratios in Table 6 (expressed in 1960 US prices) with ratios for France, Germany,

Italy and Spain expressed for 1930 in European crop prices and for 1970, 1975 and 1980 in international dollars. Our theoretical qualms are assuaged by the high degree of correlation between two sets of estimates, one based upon direct methods and the other on backward extrapolation. To maintain consistency with earlier tables we have retained pre 1926 U.K. (i.e. the territory of Britain plus Northern Ireland plus Eire) as the base for comparison but have included estimates for the United States, Denmark and the Netherlands for a discussion of trends and convergences.

Technological possibilities for raising agrarian outputs per hectare cultivated and per worker employed took a quantum leap forward with the diffusion of chemicals, internal combustion engines, new machinery, electricity, factory farming techniques, scientific management and other inputs into European agricultures from the late nineteenth century onwards.[44] Our estimates show that the US, as the pioneer in developing 'modern' agriculture, widened its lead over Europe during the twentieth century. Only Danish agriculture has shown signs (and then only from time to time) of a capacity to rival the levels of labour productivity and rural incomes achieved in the US. Whatever may be happening to the relative efficiency of their industry and service sectors, European agricultures display no indications of any long term tendency to converge towards American standards of labour productivity and rural incomes <u>per capita</u>.[45] This arises because land-labour ratios in the United States have remained consistently and massively higher than comparable European ratios. That historical advantage (together with the high ratios of capital to labour enjoyed by American farmers) seems to have widened over the last hundred years despite the exodus of rural labour from the European countryside. Unlike industry European agricultures continue to operate within a traditional system of resource and demographic parameters that render the notion of catch-up with the United States improbable and irrelevant. European farmers, as Table 6 graphically reveals, have continued to maximise returns per hectare cultivated. Their

superiority over the Americans on this particular indicator is long standing, very clear, and in the Dutch case vivid.

Thus the progress and relative efficiencies of national agricultures are best compared within a resource heritage of similar or potentially comparable land-labour ratios. When we use data for the U.K. as our standard of what other continental economies could hope historically to achieve in terms of output per worker and returns per hectare, the degrees of divergence and convergence over the last century emerged as illuminating to reflect upon -both within an agrarian context and also in the wider context of relative changes in levels of per capita income within Europe over the last two centuries.

For northwestern Europe (France, Germany, Denmark and the Netherlands) convergence towards U.K. levels of labour productivity (O/LM) could be anticipated in 1890 if not long before -when gaps had already narrowed. The disappearance of differentials in rural incomes (O/L) across this sub-group of countries would, however, take longer to achieve because their farms and tenurial systems sustained far larger numbers of redundant and underemployed family labourers than had traditionally been the case within British agriculture. As the relative size of agrarian work forces in these four continental countries decreased over time, the productivity and incomes of those who remained in the countryside converged towards (and in the cases of Denmark and Holland surpassed) historical standards set by the lead country.

As the data shows progress in the reallocation of farm labour to industry and services was clearly restrained and interrupted by the effects of two world wars and the great depression, but the long term trends towards convergence are clear and familiar from kuznetsian literature on structural change.

Table 6. Land and Labour Productivities in European and American Agricultures, 1890-1980

Output per Worker (O/L) Pre 1926 U.K. =100

	Netherlands	Denmark	France	Germany	Italy	Spain	US
1890	82	44	52	63	28	33	125
1910	90	107	55	68	30	31	129
1930	94	127	58	55	30	41	145
1950	94	97	51	42	22	20	168
1960	103	114	59	44	27	22	165
1970	92	108	62	61	32	27	212
1975	108	113	67	66	35	32	231
1980	124	108	69	75	39	33	247

Output per Male Worker (O/LM) Pre 1926 U.K. = 100

	Netherlands	Denmark	France	Germany	Italy	Spain	USA
1890	89	82	72	89	45	38	128
1910	92	147	82	118	45	32	136
1930	91	162	88	104	43	39	146
1950	84	131	71	69	28	19	185
1960	109	119	76	91	34	23	232
1970	87	131	79	105	38	27	215
1975	101	150	88	105	41	36	241
1980	116	126	90	105	42	41	265

Output per Hectare (O/H) Pre-1926 UK = 100

	Netherlands	Denmark	France	Germany	Italy	Spain	US
1890	192	140	128	148	146	58	35
1910	237	202	136	205	161	55	35
1930	282	270	153	218	180	61	41
1950	310	228	111	176	134	46	42
1960	383	246	122	205	164	57	41
1970	384	217	128	208	156	59	36
1975	473	218	134	219	162	70	38
1980	525	188	127	194	151	70	38

Notes and sources: the ratios are calculated in terms of US prices for 1960. See Appendix A.

Unfortunately for their rural populations the advance of Europe's Mediterranean regions towards parity with U.K. levels of productivity has still not occurred. Although they experienced unusually rapid rates of growth in the productivity of labour employed from 1950 to 1980, Italian and Spanish agriculture have not caught up.[46] Despite high levels of emigration and migration to the towns and the diffusion of new additions to the

stock of knowledge available for raising the pruductivity of Mediterranean farming, the average productivity of males employed (O/LM) and average incomes received by workers dependant upon Italian and Spanish agricultures (O/L) stand in comparative terms roughly where they were a century ago. Returns per hectare cultivated (O/H) certainly improved in relative terms but at nothing like the rates that approximated to the outstanding performance of farmers in the Netherlands. Until new agrarian technologies emerge to compensate for their initial or base line disadvantages of relatively high ratios of labour to land (by land here we mean hectares of comparable fecundity), Mediterranean agricultures seem severely and persistently constrained in their attempts to move towards the standards of labour productivity long established by the farmers of the U.K. and latterly by farmers throughout western Europe. To 'catch-up' they must maximize returns per acre and shed labour. While the potential to raise final output and gross value per hectare cultivated appears <u>prima facie</u> greater in Spain than Italy, there are limits (to the maximization of returns per hectare) set by price and income elasticities of demand for Mediterranean produce and by basic resource endowments. In terms of returns per hectare the record of Italian farmers was already impressive in 1910 but has hardly improved in relation to the United Kingdom since 1930. There can, moreover, be no easy assumption that the astonishing but special achievements of the Netherlands in raising productivity per hectare cultivated are more than tangentially relevant to Italy and Spain.[47] No doubt the farms of Mediterranean Europe and to a more limited extent farms located in some parts of north western Europe continue to sustain labour that could be released to industrial and service sectors without reducing the potential growth of agricultural output. That option first assumes the urban economy will develop and continue to atract more labour into better paid and secure jobs outside agriculture. Secondly the last stages of structural change in Europe depends upon the further reorganization of tenures and farming methods in order to achieve economies of scale within agriculture. Even in the late twentieth century and at this

advanced stage of European industrialization, there is no expectation that conditions for the further transformation of Italian and Spanish agriculture will be established easily or quickly enough to bring about a convergence towards the advanced standards of labour procutivity achieved by the United Kingdom let alone by Holland, the present day frontrunner. While the size of the productivity gap that has now opened up between European and American agricultures really undermines any prospects for catch-up over the foreseeable future with the United States. What European farmers face is an almost insuperable natural disadvantage in relation to that land abundant continent.

V

Comparative economic history requires a reasonably secure data base rooted in productivity estimates in order to advance understanding of the pace and pattern of European development over the long run. Our estimates and critical survey of other research in this field shows that the construction of that base is fraught not only with the usual empirical difficulties involved in using imperfect data but with serious conceptual problems involved in defining outputs and inputs for purposes of international comparison. Numbers continue to appear but some are ambiguous in meaning and others provide misleading indices of the gaps in productivity across countries. Nevertheless (and in the absence of historical data required for direct estimation) backward extrapolation, at least as far as 1910, can provide reasonable predictions for the levels of land and labour productivities that prevailed eighty or a hundred years ago.

Furthermore, inferences drawn from the estimates of comparative levels of productivity for 1910 and from the trends towards convergence over the twentieth century, provide the statistical basis for some general observations on connections between agriculture and industry in European economic history. Economic historians know that the industrialization of the lead

or reference country (U.K.) was facilitated by high and increasing levels of labour productivity in agriculture which allowed that economy to release high shares of the workforce to towns, industry and services as well as to its imperial markets overseas at an unusually early date.[48] The Kingdom's comparative advantages emanated from historically favourable land-labour ratios and from natural endowments that were in general hospitable to the limited range of agrarian technologies available to raise returns per hectare between the late Middle Ages and the late nineteenth century.

By comparison the long term growth of most other continental economies seems constrained by a historical legacy of higher population densities coupled with unfavourable land-labour ratios. In Mediterranean Europe this legacy was not only relatively more malign but the environmental constraints upon the spread of new fodder crops, rotations legumes and the mixed husbandry of the first agrarian revolution held their potential for development way below the achievements of north western Europe right down to the presente day.[49] Indeed the record for 1890-80 suggests that the comparative disadvantages of Mediterranean Europe in agriculture have perhaps been as pronounced as the comparative disadvantage of Europe as a whole vis-à-vis American agriculture. The prospects of Spain, Italy and similar regions for convergence resides (and presumably have resided for perhaps two or three centuries) in reducing the shares of employment in agriculture to a tiny proportion of the present workforce and in concentrating on the production of an entirely narrow range of crops suited to Mediterranean conditions and for which income elasticities of demand are high. Looking back over <u>la longue durée</u> persuades us that the final run down of Europe's relatively backward agricultures will be difficult to achieve even in the late twentieth century; and that such agricultures were never placed to lend the kind and scale of support for industry that favoured the first industrial nation and its immediate followers on the continent in the eighteenth and ninetenth centuries.

ENDNOTES

1. Parker, 'Interview', p. 24.
2. Senghaas, European experience.
3. Pollard, Peacefull conquest is perhaps the last text to base an analysis of European economic history upon a British paradigm. Recent texts are more eclectic and the article by Crafts, 'British industrialization', really marks a change of approach.
4. O'Brien, 'Do we have a typology?'
5. Coombs et al, Economics and technical change.
6. The present data base is not secure. See Bairoch, 'International industrialization levels', Maddison, Phases of capitalist development, Maddison, 'A comparison of levels of GDP per capita'.
7. Van Ooststroom and Maddison, 'An international comparison', and O'Brien and Toniolo, 'The poverty of Italy'.
8. See Appendix B.
9. Ojala, Agriculture and economic progress, Mitchell and Deane, Abstract of British historical statistics, Dewey, British agriculture, Toutain, Le produit de l'agriculture, Hoffmann et al, Das Wachstum der deutschen Wirtschaft.
10 Federico, 'Il valore aggiunto dell' agricoltura', Simpson, 'La producción agraria'; 'New estimates for agricultural production', and 'Los límites del crecimiento agrario'.
11 See fns. 9 and 10 and Vandellós, 'La richesse', and Kennedy, Industrial structure, App. A and his unpublished data set for the volume cited above.
12 O'Brien and Toniolo, 'The poverty of Italy'.
13 For the significance for productivity measurement of the problem involved in measuring the agricultural workforce see Crafts, 'Economic growth in France and Britain', and Schmitt, 'Agriculture in XIXth century France and Britain'.
14 Bairoch, 'La population active'.
15 Maddison, Economic growth in the West, pp. 208-230 is excellent on the problem of defining labour input.
16 Moore, Economic demography, pp. 42-7 and 196-204, and Dennison, Why growth rates differ, pp. 183-4.
17 F.A.O. Yearbook.
18 Crafts, 'Patterns of development', and Maddison, Phases of capitalist

development.

19 The method is more useful for discussions of living standards. See Bekaert, 'Caloric consumption'.

20 Van Zanden, 'The first green revolution'.

21 Tracy, Agriculture in Western Europe.

22 Bagwhati and Hansen, 'Should growth rates be evaluated at international prices?'

23 O'Brien and Keyder, Economic growth have, however, been criticized for underestimating the retardation of France compared to Britain. That debate is surveyed by Cameron and Freedman, 'French economic growth'. These figures also imply that Fremdling, 'Productivity comparisons' has probably exaggerated the relative backwardness of Germany compared to Britain between 1855 and 1913.

24 Moore, Economic demography.

25 Kravis et al, A system of international comparisons.

26 The literature is surveyed in Summers and Heston, 'The Penn world trade'.

27 Prasada Rao, International comparisons of agricultural production and Appendix (sources for table 6).

28 Hayami and Ruttan. Agricultural development, and Yamada and Ruttan, 'International comparisons'.

29 We constructed output estimates for 1960 based upon the data published in Hayami and Ruttan, Agricultural development, see Appendix.

30 Eichengreen, 'What have we learned from historical comparisons of income and productivity'.

31 Prados de la Escosura, From empire to nation, ch. 3.

32 Appendix, Gourevitch, 'International trade, domestic coalitions'.

33 Bairoch. Commerce extérieur, ch. 6.

34 Appendix, Table A.4.

35 Galassi, 'Reassessing Mediterranean agriculture', Green, Agriculture and tariff reform, and Tracy, L'état et l'agriculture en Europe occidentale.

36 This point is central to O'Brien's unresolved discussion with Crafts on the size of the agricultural and industrial workforces in France before 1914. See Crafts, 'Economic growth in France and Britain', and Schmitt's recent and interesting attempt to resolve that problem in Schmitt, 'Agriculture in XIXth century France and Britain'.

37 Grigg, The dynamics of agrarian change.

38 Chorley, 'The agricultural revolution'.

39 Galassi, 'Reassessing Mediterranean agriculture'; Simpson, "Límites del crecimiento agrario"; Tortella, "La historia económica de España".

40 The best overall study by Dovring, 'The transformation of European agriculture', Cohen and Galassi, 'Sharecropping and productivity', and Wade, Institutional determinants.

41 Grigg. The transformation of agriculture.

42 Ojala, Agriculture and economic progress; Toutain, Le produit de l'agriculture; Hoffmann et al., Das Wachstum der deutschen Wirtschaft;

Federico, 'Il valore aggiunto dell'agricoltura'; Vandellós, 'La richesse'.

43 Dovring, Land and labour in Europe.

44 Priebe, 'The changing role of agriculture'.

45 Williamson, 'Productivity and American leadership'.

46 Villoni, Transformazioni della società rurale.

47 Van der Meer and Van Ark, 'Growth and productivity in Dutch agriculture'.

48 Wrigley, 'Urban growth and agricultural change'.

49 Prados de la Escosura and Zamagni, El desarrollo económico en la Europa del sur: España e Italia en perspectiva histórica, and O'Brien and Toniolo, 'The poverty of Italy'.

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APPENDIX A

Table 5

Sources:

Agricultural land: Hayami and Ruttan, Agricultural development, p. 458, all countries, 1960, 1970 and 1980; Prasada Rao, International comparisons, p. 66, all countries, 1975; for 1890-1950, USA, Hayami and Ruttan, Agricultural development, pp. 480-481; Denmark and Germany, Yamada and Ruttan, 'International comparisons', Tables A-2, A-3; France, Toutain, Le produit, ii, pp. 214-215; Netherlands, Mitchell, European historical statistics, p.; Italy, O'Brien and Toniolo, 'The poverty of Italy', p. 401; Sommario di statistiche storiche italiane; United Kingdom, O'Brien and Toniolo, 'The poverty of Italy', p. 401; Mitchell, British historical statistics, pp. 186-194; Yamada and Ruttan, 'International comparisons', Table A-5; Spain, Simpson, 'New estimates'; Estadísticas básicas, p. 143.

Male labour: Hayami and Ruttan, Agricultural development, p. 457, all countries, 1960, 1970 and 1980; for 1890-1950: USA, Hayami and Ruttan, Agricultural development, p. 480; Denmark and Germany, Yamada and Ruttan, 'International comparisons', Tables A-2, A-3; Mitchell, European historical statistics, p. 164; France, U.K. ,Netherlands, Italy, Mitchell, European historical statistics, pp. 163-171; Vitali, La popolazione attiva, p. 88; Spain, Nicolau, 'La población', p. 78.

Table 6

Sources:

Levels of output for 1960 in US prices: Hayami and Ruttan, Agricultural development, pp. 454-455, estimated each country's agricultural output by using US wheat relative prices. When their figures expressed in US wheat equivalent units (1,000 kg) are multiplied by the US price of one metric ton we derive each country's output in 1960 dollars valued at US prices.

Indices of real output: Hayami and Ruttan, Agricultural development, p. 457, all countries, 1960, 1970 and 1980; for 1890-1975, USA, Denmark, U.K.; 1960-1975, France, Hayami and Ruttan, Agricultural development, pp. 467-471; Ojala, Agriculture and economic progress, pp. 191-217; Feinstein, National income, T24; Toutain, Le produit, ii, p. 128-129; Germany, Hoffmann et al., pp. 320-323; Yamada and Ruttan, 'International comparisons', Table A-2; Netherlands, van der Meer and van Ark, 'Growth and productivity', pp. 76-78; Italy, Ercolani, 'Documentazione statistica di base', pp. 410-412, 415; Spain, Simpson, 'New estimates'; Hemberg, 'Informe preliminar', p. 122; Cuentas del sector agrario

Agricultural land: Hayami and Ruttan, Agricultural development, p. 458, all countries, 1960, 1970 and 1980; Prasada Rao, International comparisons, p. 66, all countries, 1975; for 1890-1950, USA, Hayami and Ruttan, Agricultural development, pp. 480-481; Denmark and Germany, Yamada and Ruttan, 'International comparisons', Tables A-2, A-3; France, Toutain, Le produit, ii, pp. 214-215; Netherlands, Mitchell, European historical statistics, p.; Italy, O'Brien and Toniolo, 'The poverty of Italy', p. 401; Sommario di statistiche storiche italiane; United Kingdom, O'Brien and Toniolo, 'The poverty of Italy', p. 401; Mitchell, British historical statistics, pp. 186-194; Yamada and Ruttan, 'International comparisons', Table A-5; Spain, Simpson, 'New estimates'; Estadísticas básicas, p. 143.

Male labour: Hayami and Ruttan, Agricultural development, p. 457, all countries, 1960, 1970 and 1980; for 1890-1950: USA, Hayami and Ruttan, Agricultural development, p. 480; Denmark and Germany, Yamada and Ruttan, 'International comparisons', Tables A-2, A-3; Mitchell, European historical statistics, p. 164; France, U.K. ,Netherlands, Italy, Mitchell, European historical statistics, pp. 163-171; Vitali, La popolazione attiva, p. 88; Spain, Nicolau, 'La población', p. 78.

Total labour: Prasada Rao, International comparisons, p. 39, all countries, 1970, 1975 and 1980; for 1890-1960, USA, Davis, Easterlin and Parker (eds.), American economic growth, p. 187; Denmark, Germany, France, U.K., Mitchell, European historical statistics, pp. 162-171; Toutain, Le produit, ii, p. 201; Netherlands, van der Meer and van Ark, 'Growth and productivity', pp. 76-78; Italy, Zamagmi, 'A century of change', p. 36; Spain, Nicolau, 'La población', p. 78.

Table A.1

Agricultural Productivity in Five European Countries c.1910
(Pounds Sterling at U.K. prices)

	Spain	Italy	France	Germany	U.K.
Agricultural Final Output (O) (10^6 £)	139.8	282.4	432.4	483.4	207.2
Gross Value Added at market prices (VA) (10^6 £)	132.5	263.9	380.5	442.2	138.7
Agricultural Land (T) (000 Ha)	31,308	20,799	36,799	34,878	25,202
Arable Land (Ta) (000 Ha)	19,149	14,719	21,561	26,200	7,883
Labour Force in Agriculture (L) (000)	5,137	10,538	8,560	9,883	2,381
Male Labour Force in Agriculture (Lm) (000)	4,680	6,465	5,331	5,284	2,205
Agricultural Final Output per Worker (O/L) (£)	27.2	26.8	50.5	48.9	87.0
Agricultural Final Output per Male Worker (O/Lm) (£)	29.9	43.7	81.1	91.5	94.0
Final Output per Hectare of Agricultural Land (O/T) (£)	4.5	13.6	11.8	13.9	8.2
Value Added per Worker (VA/L) (£)	25.8	25.0	44.5	44.7	58.3
Value Added per Male Worker (VA/Lm) (£)	28.3	40.8	71.4	83.7	62.9
Value Added per Hectare of Agricultural Land (VA/T) (£)	4.2	12.7	10.3	12.7	5.5
Agricultural Land per Worker (T/L) (Ha)	6.1	2.0	4.3	3.5	10.6
Agricultural Land per Male Worker (T/Lm) (Ha)	6.7	3.2	6.9	6.6	11.4

Table A.2

Agricultural Productivity in Five European Countries c.1910
(at national prices)

	Spain (Pta)	Italy (Lire)	France (Francs)	Germany (Marks)	U.K. (£)
Agricultural Final Output (O)					
(10^6)	3,842	8,084	11,666	10,565	207.2
Gross Value Added at market prices (VA)					
(10^6)	3,650	7,554	10,266	9,665	138.7
Agricultural Land (T)					
(000 Ha)	31,308	20,799	36,799	34,878	25,202
Arable Land (Ta)					
(000 Ha)	19,149	14,719	21,561	26,200	7,883
Labour Force in Agriculture (L)					
(000)	5,137	10,538	8,560	9,883	2,381
Male Labour Force in Agriculture (Lm)					
(000)	4,680	6,465	5,331	5,284	2,205
Agricultural Final Output per Worker (O/L)					
	748	767	1,363	1,069	87.0
Agricultural Final Output per Male Worker (O/Lm)					
	821	1,250	2,188	1,999	94.0
Final Output per Hectare of Agricultural Land (O/T)					
	123	389	317	303	8.2
Value Added per Worker (VA/L)					
	711	717	1,199	978	58.3
Value Added per Male Worker (VA/Lm)					
	780	1,168	1,926	1,829	62.9
Value Added per Hectare of Agricultural Land (VA/T)					
	117	363	279	277	5.5
Agricultural Land per Worker (T/L)					
(Ha)	6.1	2.0	4.3	3.5	10.6
Agricultural Land per Male Worker (T/Lm)					
(Ha)	6.7	3.2	6.9	6.6	11.4

Table A.3

Trading and Purchasing power Parity Exchange Rates with Sterling for Five European Currencies c. 1910

	Agricultural purchasing power parity rates		Trading exchange rates
	(1) weighted by national output	(2) weighted by British output	(3)
Pesetas per £	27.4908	35.1976	27.24
Lire per £	28.6216	29.8612	25.00
Francs per £	26.9776	27.3074	25.25
Marks per £	21.8556	21.3617	20.00

Table A.4

Composition of Agricultural Final Output in Five European Countries c. 1910 (valued in national and U.K. prices))

	France		Germany		Italy		Spain		U.K.
	Francs	£	Marks	£	Lire	£	Pta	£	£
Cereals	22.2	17.9	18.6	13.1	20.9	15.2	31.4	22.6	11.0
Pulses	0.8	0.4	0.3	0.2	1.3	1.1	3.3	2.0	0.7
Vegetables	4.8	3.7	8.1	10.2	7.2	14.9	11.8	16.0	6.7
Raw Material	3.4	3.6	4.7	4.8	5.8	3.7	3.4	2.8	2.9
Fruits Nuts	11.7	11.7	1.6	4.0	9.0	17.6	6.9	16.7	2.4
Wines (Must)	12.5	13.9	1.1	0.5	22.4	14.3	6.9	9.8	0.0
Olives	0.2	0.1	0.0	0.0	4.6	3.2	6.0	5.3	0.0
Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
Meat	22.2	21.3	34.6	33.2	13.1	12.4	17.4	15.4	42.7
Poultry Eggs	9.3	14.4	3.6	5.0	7.4	9.1	4.8	5.1	6.0
Milk	12.9	13.0	27.1	29.0	7.8	8.1	8.0	4.3	23.2
Other	0.0	0.0	0.3	0.0	0.0	0.4	0.1	0.0	1.1
Non-animal	54.9	50.5	33.7	32.3	68.1	67.7	68.3	73.7	25.3
Animal	45.1	49.5	66.3	67.7	31.9	32.3	31.7	26.3	74.7

APPENDIX A

Sources:

Tables A.1 and A.2

Final output and gross value added: Spain, Appendix B and value added to final output ratio derived from Vandellós, 'La richesse et le revenue de la peninsule ibérique'; Italy, Federico, 'Il valore aggiunto dell'agricoltura'; France, Toutain, Le produit de l'agriculture française, pp. 128-129, 131; United Kingdom, Ojala, Agriculture and economic progress, pp. 191-217; Germany, Hoffmann et al., Das wachstum der deutschen wirtschaft, pp. 320-323.

Note: except for Spain, there are discrepancies between the figures in Tables A.1 and A.2 and in Appendix B since the latter's coverage of final output despite being very large is not complete.

Agricultural land and arable land: We follow Hayami and Ruttan's (and F.A.O.'s) definition of land inputs and derive figures for arable land (including temporary fallow and grass) and agricultural land (to cover also permanent pasture and meadows). Whereas there are not major problems in identifying the extension of arable land, the assessment of total agricultural land presents obstacles difficult to overcome, i.e., rough and mountain grazing is not always included (e.g., O'Brien and Toniolo, 'The poverty of Italy').

For Spain, we followed Simpson's proposal of de-aggregating meadows and pasture from the category "meadows, pasture and forestry" offered by Spanish official statistics and we adopted conversion coefficients from F.A.O.; arable land from Simpson, 'New estimates for agricultural production'; Italy and the United Kingdom, O'Brien and Toniolo, 'The poverty of Italy', p. 401, but including rough and mountain grazing into agricultural land; France, Toutain, Le produit, ii, 214-215; Hoffmann et al., Das wachstum, pp. 268-269.

Labour and male labour: Spain, Nicolau, 'La población', p.78; Italy, male labour, Vitali, La popolazione attiva, p. 88; total labour, Zamagni, 'A century of change', p. 36; France, total labour, Toutain, Le produit, ii, 201; male labour, Mitchell, European historical statistics, p. 163; U.K. and Germany, Mitchell, European historical statistics, p. 163-166, 171.

Table A.3: Purchasing power parity (PPP) exchange rates are derived from Appendix B. PPP exchange rates are obtained through weighting pairs of national price sets (U.K.'s and another nation's) twice: by each continental European nation's output and by U.K.'s output. Appendix B provides information to obtain directly PPPs weighted by British output and data to derive PPPs weighted by each continental European country's output. Trading

exchange rates, O'Brien and Keyder, Economic growth, p. 47; Fremdling, 'Productivity comparisons', p. 33; Italy's Lira and the French Franc were exchanged at 1:1 ratio in the eve of World War I; Spain, Martínez Méndez, 'Nuevos datos', p. 564.

Table A.4: Appendix B.

APPENDIX B

APPENDIX B

Agricultural Final Output in Western Europe: Spain, Italy, France, Germany and the United Kingdom c. 1910.

Final agricultural output is defined as total production less seed, animal feed and wastage. Final output for most crops and animal produce in the five countries were multiplied by two sets of farm gate (or by shadow prices wherever farm gate prices were not available) to derive aggregate final outputs for each nation's agriculture. U.K. prices and each nation's prices were used alternatively. This Appendix presents physical quantities for final output expressed in metric quintals (MQ), national sets of farm gate prices (and shadow prices) per metric quintal of each product, and values in sterling and in each nation's own currency for every country's agricultural products.

The sources used were: for Spain, James Simpson's unpublished work sheets for his paper 'New estimates for agricultural production', with minor adjustments for seed and animal feed; Italy, Giovanni Federico's unpublished manuscript 'Il valore aggiunto dell'agricoltura'; for France, Jean Claude Toutain's Le produit de l'agriculture franÇaise, vol. II; for the United Kingdom, E.M. Ojala's Agriculture and economic progress; for Germany, Walther Hoffmann and associates, Das wachstum der deutschen wirtschaft.

	A	B	C	D	E	F	G
7			FINAL	OUTPUT			
8	PRODUCTS						
9			SPAIN	ITALY	FRANCE	U.K.	GERMANY
10			000 MQ	000 MQ	000 MQ	000 MQ	000 MQ
11							
12	CEREALS						
13	Wheat		30532	45237	74820	12560	32813
14	Barley		5594	779	5916	13421	0
15	Rye		5433	1057	9730	183	66045
16	Oats		845	0	12121	7590	6077
17	Maize		3844	12821	3399	0	0
18	Rice		2164	4956	0	0	0
19	Millet		13				
20	Sorghum		6				
21	Tranquillon		168		945		1761
22	Escanda		100				3469
23	Others		0	136	2749		
24							
25	LEGUMES						
26	Chickpeas		795	313			
27	Broad beans		744	2313			
28	Beans		1280	945	2500	1189	86
29	Peas		66	138		813	1049
30	Lentils		84	70			
31	Carob beans		128	28			
32	Lupin		56	339			
33	Alvejones		21				
34	Yeros		34	73			
35	Others		0				
36							
37							
38	VEGETABLES						
39	Potatoes		20660	14213	75350	46882	174733
40	Onions			1119			
41	Garlic						
42	Tomatoes		3018	6781			
43	Melons		2487	1762			
44	Cabbages			9794			
45	Lettuce		1548				
46	Peppers		1365				
47	Cucumber		315				
48	Sweet potatoes		589				
49	Asparagus			83			
50	Green Beans			1504			
51	Green Broad Beans						
52	Green Peas						
53	Carrots		124				
54	Artichokes			728			
55	Cauliflower						
56	Radish		19				
57	Spinach						
58	Eggplant						
59	Celery etc.			916			
60	Forrage Beet		0				
61	Turnips		0				
62	Vegt. NES			4772		12581	37610
63	Others						
64							

AGRICULTURAL FINAL OUTPUT IN WESTERN EUROPE, c. 1910

	A	B	C	D	E	F	G
7			FINAL	OUTPUT			
8	PRODUCTS						
9			SPAIN	ITALY	FRANCE	U.K.	GERMANY
10			000 MQ	000 MQ	000 MQ	000 MQ	000 MQ
65							
66	RAW MATERIALS						
67	Sugar Beet		8662	15180	74690	31	150077
68	Groundnuts		126	125	521		957
69	Hops				37	180	191
70	Sugar Cane		2828				
71	Esparto Grass		1097				
72	Saffron		1				
73	Tobacco		3	69	210		250
74	Cotton						
75	Flax		9	28	327	106	126
76	Hemp		75	674			
77	Wool		276	204	344	473	232
78	Silk Cocoons		8	563	66		
79	Liquorice			150			
80	Others						
81							
82	FRUITS & NUTS					4726	17830
83	Oranges		8320	3347			
84	Lemons		392	3724			
85	Carobs		0	550			
86	Pomegranates		297				
87	Almonds		953	2356			
88	Figs		1443	2477			
89	Hazelnuts		0	213			
90	Chestnuts		1536	6900			
91	Walnuts		137	520			
92	Strawberries		68				
93	Plums		271	609			
94	Cherries		168	686			
95	Apricots		152	213			
96	Pears		640	1984			
97	Apples		1533	2832			
98	Peaches		192	2260			
99	Quinces		79	69			
100	Grapes		1972	2300			
101	Raisins		189				
102	Other Citrics			350			
103	India Figs			1100			
104	Pistachio			16			
105	Bananas						
106	Others						
107							
108	WINES						
109	Must (000Hl)		15062	42855	52790		2419
110	Subproducts						
111	Cider (000Hl)				15900		
112							
113	OLIVES						
114	Olive Oil (000Hl)		2197	2739			
115	Olives		535	200	713		
116	Subproducts						
117							

AGRICULTURAL FINAL OUTPUT IN WESTERN EUROPE, c. 1910

	A	B	C	D	E	F	G
7			FINAL	OUTPUT			
8	PRODUCTS						
9			SPAIN	ITALY	FRANCE	U.K.	GERMANY
10			000 MQ	000 MQ	000 MQ	000 MQ	000 MQ
118							
119	PASTURE & FORESTRY					36238	
120							
121	MEAT & DAIRY PRODUCE						
122	MEAT						
123	Beef & Veal		1162	2577	8910	7706	10575
124	Mutton & Lamb		612	703	1200	3104	636
125	Goatmeat		132				197
126	Pigmeat		1877	2559	5240	4064	18594
127	Rabbitmeat			155			
128	Horsemeat			78			
129							
130	POULTRY & EGGS						
131	Poultrymeat			909		335	894
132	Eggs			2461	2393	1379	2350
133							
134	MILK				88000	79964	
135	Cow		6938	30836			215231
136	Sheep		310	2812			
137	Goat		1915	2082			9573
138							
139	HONEY						166
140							
141	HORSES(000)			33		76	
142							
143	Other Produce						
144							
145							
146	TOTAL						

	A	H	I	J	K	L
7		PRICES	AND	SHADOW	PRICES	
8	PRODUCTS					
9		SPAIN	ITALY	FRANCE	U.K.	GERMANY
10		PTA/MQ	Lire/MQ	FF/MQ	L/MQ	M/MQ
11						
12	CEREALS					
13	Wheat	26,48	27,22	24,80	0,70	19,98
14	Barley	20,50	19,00	16,23	0,67	17,06
15	Rye	21,96	18,83	15,89	0,48	16,34
16	Oats	19,01	21,41	16,85	0,64	15,69
17	Maize	22,92	19,62	16,37	0,41	17,29
18	Rice	25,51	23,14	23,89	0,69	19,58
19	Millet	19,24	19,78	17,92	0,51	14,43
20	Sorghum	15,77	16,21	14,77	0,42	11,90
21	Tranquillon	20,90	22,11	15,89	0,56	18,16
22	Escanda	22,41	22,11	20,99	0,60	19,98
23	Others	21,18	22,11	16,37	0,56	15,77
24						
25	LEGUMES					
26	Chickpeas	60,97	29,75	57,10	1,62	46,00
27	Broad beans	23,99	21,49	22,47	0,64	18,10
28	Beans	40,97	31,43	34,30	0,69	29,60
29	Peas	33,56	34,78	34,30	0,69	25,14
30	Lentils	30,51	29,91	28,57	0,48	23,02
31	Carob beans	18,01	17,99	16,87	0,48	13,59
32	Lupin	18,68	14,18	17,49	0,50	14,09
33	Alvejones	15,90	16,34	14,89	0,42	12,00
34	Yeros	19,63	19,18	18,38	0,52	14,81
35	Others	15,83				
36						
37						
38	VEGETABLES					
39	Potatoes	8,76	10,99	7,07	0,20	3,84
40	Onions	9,21	9,47		0,49	
41	Garlic	9,21	9,47		0,49	
42	Tomatoes	10,45	5,80		2,12	
43	Melons	12,89	9,48			
44	Cabbages	8,76	9,00		0,37	
45	Lettuce	14,10	14,49			
46	Peppers	17,61	18,10			
47	Cucumber	14,21	14,61			
48	Sweet potatoes	16,47	16,93			
49	Asparagus	43,37	44,58			
50	Green Beans	11,64	11,97			
51	Green Broad Beans					
52	Green Peas					
53	Carrots	4,10	4,21			
54	Artichokes	37,01	38,04			
55	Cauliflower	14,59	15,00		0,94	
56	Radish	6,68	6,87			
57	Spinach					
58	Eggplant					
59	Celery etc.	11,58	11,90			
60	Forrage Beet	2,01				
61	Turnips	3,56				
62	Vegt. NES		15,00		0,37	4,55
63	Others					
64						

	A	H	I	J	K	L
65						
66		PRICES	AND	SHADOW	PRICES	
67	PRODUCTS					
68		SPAIN	ITALY	FRANCE	U.K.	GERMANY
69		PTA/MQ	Lire/MQ	FF/MQ	L/MQ	M/MQ
70	RAW MATERIALS					
71	Sugar Beet	3,48	2,63	2,69	0,11	2,14
72	Groundnuts	38,82	34,40	30,71	0,79	24,06
73	Hops	439,26	451,53	120,97	11,67	256,80
74	Sugar Cane	3,10	3,19	2,90	0,08	2,34
75	Esparto Grass	6,72	6,91	6,29	0,29	5,07
76	Saffron	9084,00	9337,44			
77	Tobacco	110,00	98,00	100,00	5,49	58,11
78	Cotton					
79	Flax	166,64	112,73	134,56	4,09	47,06
80	Hemp	94,47	110,76	134,56	1,73	47,06
81	Wool	183,86	260,00	179,00	7,54	335,20
82	Silk Cocoons	539,80	340,00	348,00	8,79	249,57
83	Liquorice	53,83	55,33	50,11	1,42	40,37
84	Others					
85						
86	FRUITS & NUTS				1,07	9,50
87	Oranges	8,29	15,00		0,53	
88	Lemons	9,71	10,50		0,69	
89	Carobs	10,36	12,00			
90	Pomegranates	9,09	9,34		0,52	
91	Almonds	49,26	51,99		7,62	
92	Figs	10,25	8,96		0,50	
93	Hazelnuts	73,31	70,05		2,83	
94	Chestnuts	10,40	14,42		0,58	
95	Walnuts	31,89	50,03		2,02	
96	Strawberries	45,29	46,55		2,60	
97	Plums	12,55	24,96		1,11	
98	Cherries	15,28	19,97		2,30	
99	Apricots	18,92	43,19		2,41	
100	Pears	10,15	18,00		1,08	
101	Apples	8,07	21,19		0,91	
102	Peaches	26,17	48,00		2,68	
103	Quinces	7,85	17,49		0,98	
104	Grapes	16,86	25,70		1,59	
105	Raisins	85,59	87,98		2,51	
106	Other Citrics	16,68	17,14		0,53	
107	India Figs	3,89	4,00		0,22	
108	Pistachio	583,68	600,00		33,48	
109	Bananas				0,40	
110	Others					
111						
112	WINES					
113	Must (000Hl)	17,64	40,26	22,12	0,91	45,18
114	Subproducts					
115	Cider (000Hl)	13,61	14,16	12,75	0,53	26,00
116						
117	OLIVES					
118	Olive Oil (000Hl)	99,88	127,76	99,52	3,21	75,36
119	Olives	20,13	35,00	28,05	0,65	15,19
120	Subproducts					
121						
122						

	A	H	I	J	K	L
123		PRICES	AND	SHADOW	PRICES	
124	PRODUCTS					
125		SPAIN	ITALY	FRANCE	U.K.	GERMANY
126		PTA/MQ	Lire/MQ	FF/MQ	L/MQ	M/MQ
127						
128	PASTURE & FORESTR				0,19	
129						
130	MEAT & DAIRY PROD					
131	MEAT					
132	Beef & Veal	176,30	197,71	154,50	5,79	139,70
133	Mutton & Lamb	181,20	128,88	212,20	7,80	129,42
134	Goatmeat	236,70	128,88	212,20	7,80	129,42
135	Pigmeat	151,20	151,04	151,53	4,82	107,91
136	Rabbitmeat	165,06	169,68	170,23	5,42	121,23
137	Horsemeat	124,72	128,21	128,63	4,09	91,60
138						
139	POULTRY & EGGS					
140	Poultrymeat	185,99	181,90		9,06	151,80
141	Eggs	173,67	169,84	117,84	6,75	100,17
142						
143	MILK	31,00	15,50	16,00	0,60	12,50
144	Cow	31,00	15,50	16,00	0,60	12,50
145	Sheep	36,00	26,49	18,58	0,70	14,50
146	Goat	42,00	27,52	21,67	0,81	12,50
147						
148	HONEY					220,00
149						
150	HORSES(000)	468,82	481,93	439,08	31,31	353,75
151						
152	Other Produce			96,00		
153						
154						
155	TOTAL					

	A	AB	AC	AD	AE	AF
6						
7		VALUE IN	STERLING			
8	PRODUCTS					
9		SPAIN	ITALY	FRANCE	U.K.	GERMANY
10		000 L	000 L	000 L	000 L	000 L
11						
12	CEREALS	31638	41633	72491	22782	61858
13	Wheat	21485	31833	52651	8838	23091
14	Barley	3760	524	3977	9022	0
15	Rye	2620	510	4693	88	31854
16	Oats	538	0	7719	4833	3870
17	Maize	1583	5281	1400	0	0
18	Rice	1489	3410	0	0	0
19	Millet	7	0	0	0	0
20	Sorghum	2	0	0	0	0
21	Tranquillon	93	0	525	0	978
22	Escanda	60	0	0	0	2066
23	Others	0	75	1527	0	0
24						
25	LEGUMES	2845	2980	1723	1379	782
26	Chickpeas	1288	506	0	0	0
27	Broad beans	474	1474	0	0	0
28	Beans	882	651	1723	819	59
29	Peas	45	95	0	560	723
30	Lentils	40	34	0	0	0
31	Carob beans	61	13	0	0	0
32	Lupin	28	168	0	0	0
33	Alvejones	9	0	0	0	0
34	Yeros	18	38	0	0	0
35	Others	0	0	0	0	0
36						
37						
38	VEGETABLES	22291	40941	14904	13891	48369
39	Potatoes	4087	2811	14904	9273	34562
40	Onions	0	549	0	0	0
41	Garlic	0	0	0	0	0
42	Tomatoes	6400	14379	0	0	0
43	Melons	0	0	0	0	0
44	Cabbages	0	3666	0	0	0
45	Lettuce	0	0	0	0	0
46	Peppers	0	0	0	0	0
47	Cucumber	0	0	0	0	0
48	Sweet potatoes	0	0	0	0	0
49	Asparagus	0	0	0	0	0
50	Green Beans	0	0	0	0	0
51	Green Broad Beans	0	0	0	0	0
52	Green Peas	0	0	0	0	0
53	Carrots	0	0	0	0	0
54	Artichokes	0	0	0	0	0
55	Cauliflower	0	0	0	0	0
56	Radish	0	0	0	0	0
57	Spinach	0	0	0	0	0
58	Eggplant	0	0	0	0	0
59	Celery etc.	0	0	0	0	0
60	Forrage Beet	0	0	0	0	0
61	Turnips	0	0	0	0	0
62	Vegt. NES	0	0	0	4618	13807
63	Others	0	0	0	0	0
64						
65						

	A	AB	AC	AD	AE	AF
66						
67		VALUE IN	STERLING			
68	PRODUCTS					
69		SPAIN	ITALY	FRANCE	U.K.	GERMANY
70						
71		000 L	000 L	000 L	000 L	000 L
72	RAW MATERIALS	3907	10075	14451	6104	22575
73	Sugar Beet	921	1614	7940	3	15953
74	Groundnuts	99	99	411	0	755
75	Hops	0	0	434	2101	2230
76	Sugar Cane	233	0	0	0	0
77	Esparto Grass	321	0	0	0	0
78	Saffron	0	0	0	0	0
79	Tobacco	16	379	1153	0	1372
80	Cotton	0	0	0	0	0
81	Flax	35	113	1339	434	516
82	Hemp	130	1167	0	0	0
83	Wool	2082	1538	2594	3566	1749
84	Silk Cocoons	70	4952	580	0	0
85	Liquorice	0	213	0	0	0
86	Others	0	0	0	0	0
87						
88	FRUITS & NUTS	23299	48135	47447	5037	19005
89	Oranges	4434	1784	0	0	0
90	Lemons	269	2552	0	0	0
91	Carobs	0	0	0	0	0
92	Pomegranates	155	0	0	0	0
93	Almonds	7261	17951	0	0	0
94	Figs	721	1238	0	0	0
95	Hazelnuts	1	602	0	0	0
96	Chestnuts	891	4002	0	0	0
97	Walnuts	277	1050	0	0	0
98	Strawberries	176	0	0	0	0
99	Plums	300	674	0	0	0
100	Cherries	387	1578	0	0	0
101	Apricots	366	513	0	0	0
102	Pears	690	2137	0	0	0
103	Apples	1390	2568	0	0	0
104	Peaches	514	6053	0	0	0
105	Quinces	77	67	0	0	0
106	Grapes	3142	3664	0	0	0
107	Raisins	474	0	0	0	0
108	Other Citrics	0	186	0	0	0
109	India Figs	0	246	0	0	0
110	Pistachio	0	536	0	0	0
111	Bananas	0	0	0	0	0
112	Others	0	0	0	0	0
113						
114	WINES	13749	39118	56554	0	2208
115	Must (000Hl)	13749	39118	48187	0	2208
116	Subproducts	0	0	0	0	0
117	Cider (000Hl)	0	0	8367	0	0
118						
119	OLIVES	7398	8921	461	0	0
120	Olive Oil (000Hl)	7052	8792	0	0	0
121	Olives	346	129	461	0	0
122	Subproducts	0	0	0	0	0
123						

	A	AB	AC	AD	AE	AF
124		VALUE IN	STERLING			
125	PRODUCTS					
126		SPAIN	ITALY	FRANCE	U.K.	GERMANY
127		000 L	000 L	000 L	000 L	000 L
128						
129	PASTURE & FORESTR	0	0	0	6777	0
130						
131	MEAT & DAIRY PROD					
132	MEAT	21577	33895	86191	88395	157371
133	Beef & Veal	6725	14914	51566	44598	61202
134	Mutton & Lamb	4771	5480	9354	24197	4958
135	Goatmeat	1029	0	0	0	1536
136	Pigmeat	9052	12342	25271	19600	89675
137	Rabbitmeat	0	840	0	0	0
138	Horsemeat	0	319	0	0	0
139						
140	POULTRY & EGGS	7108	24852	58207	12345	23966
141	Poultrymeat	0	8236	42051	3035	8100
142	Eggs	0	16616	16156	9310	15866
143						
144	MILK	5948	22202	52914	48082	137217
145	Cow	4172	18542	0	0	129418
146	Sheep	216	1964	0	0	0
147	Goat	1560	1696	0	0	7799
148						
149	HONEY	0	0	0	0	0
150						
151	HORSES(000)	0	1039	0	2380	0
152						
153	Other Produce	0	0	0	0	0
154						
155						
156	TOTAL	139760	273791	405343	207180	473351
157						

	A	M	N	O	P	Q
7		VALUE	IN	NATIONAL	CURRENCIES	
8	PRODUCTS					
9		SPAIN	ITALY	FRANCE	U.K.	GERMANY
10		000 PTA	000 LIRE	000 FF	000 L	000 M
11						
12	CEREALS	1207935	1635291	2426060	22782	1931418
13	Wheat	808487	1231351	1855536	8838	655604
14	Barley	114677	14801	96017	9022	0
15	Rye	119309	19903	154610	88	1079175
16	Oats	16063	0	204239	4833	95348
17	Maize	88104	251554	55642	0	0
18	Rice	55204	114682	0	0	0
19	Millet	250	0	0	0	0
20	Sorghum	88	0	0	0	0
21	Tranquillon	3511	0	15016	0	31980
22	Escanda	2241	0	0	0	69311
23	Others	0	3000	45001	0	0
24						
25	LEGUMES	127885	102298	85750	1379	28917
26	Chickpeas	48471	9300	0	0	0
27	Broad beans	17849	49698	0	0	0
28	Beans	52442	29701	85750	819	2546
29	Peas	2205	4800	0	560	26372
30	Lentils	2563	2100	0	0	0
31	Carob beans	2305	500	0	0	0
32	Lupin	1054	4800	0	0	0
33	Alvejones	326	0	0	0	0
34	Yeros	671	1400	0	0	0
35	Others	0		0	0	0
36						
37						
38	VEGETABLES	451735	562839	532725	13891	842101
39	Potatoes	180982	156201	532725	9273	670975
40	Onions	30095	10595	0	0	0
41	Garlic	9210	0	0	0	0
42	Tomatoes	31538	39329	0	0	0
43	Melons	32057	16700	0	0	0
44	Cabbages	67355	88142	0	0	0
45	Lettuce	21872	0	0	0	0
46	Peppers	24038	0	0	0	0
47	Cucumber	4476	0	0	0	0
48	Sweet potatoes	9702		0	0	0
49	Asparagus	1941	3700	0	0	0
50	Green Beans		18000	0	0	0
51	Green Broad Beans		0	0	0	0
52	Green Peas		0	0	0	0
53	Carrots	508	0	0	0	0
54	Artichokes	7638	27697	0	0	0
55	Cauliflower	10018	0	0	0	0
56	Radish	128	0	0	0	0
57	Spinach	4907	0	0	0	0
58	Eggplant	4747	0	0	0	0
59	Celery etc.	9712	10898	0	0	0
60	Forrage Beet	0	0	0	0	0
61	Turnips	0	0	0	0	0
62	Vegt. NES		71577	0	4618	171126
63	Others	812	120000	0	0	0
64						
65						

	A	M	N	O	P	Q
66						
67		VALUE	IN	NATIONAL	CURRENCIES	
68	PRODUCTS					
69		SPAIN	ITALY	FRANCE	U.K.	GERMANY
70						
71		000 PTA	000 LIRE	000 FF	000 L	000 M
72	RAW MATERIALS	131822	455571	370961	6104	491463
73	Sugar Beet	30144	39923	200916	3	321165
74	Groundnuts	4891	4300	16000	0	23025
75	Hops		0	4500	2101	49049
76	Sugar Cane	8767	0	0	0	0
77	Esparto Grass	7372	0	0	0	0
78	Saffron	12854	0	0	0	0
79	Tobacco	330	6762	21000	0	14528
80	Cotton		0	0	0	0
81	Flax	1430	3100	44001	434	5930
82	Hemp	7094	74597	0	0	0
83	Wool	50784	53040	61576	3566	77766
84	Silk Cocoons	4289	191549	22968	0	0
85	Liquorice	414	8300	0	0	0
86	Others	3454	74000	0	0	0
87						
88	FRUITS & NUTS	263470	707792	1280000	5037	169385
89	Oranges	68973	50205	0	0	0
90	Lemons	3806	39102	0	0	0
91	Carobs	0	6600	0	0	0
92	Pomegranates	2700	0	0	0	0
93	Almonds	46945	122488	0	0	0
94	Figs	14791	22194	0	0	0
95	Hazelnuts	13	14900	0	0	0
96	Chestnuts	15974	99498	0	0	0
97	Walnuts	4369	26001	0	0	0
98	Strawberries	3066	0	0	0	0
99	Plums	3401	15201	0	0	0
100	Cherries	2567	13699	0	0	0
101	Apricots	2876	9199	0	0	0
102	Pears	6496	35705	0	0	0
103	Apples	12371	60010	0	0	0
104	Peaches	5025	108480	0	0	0
105	Quinces	616	1200	0	0	0
106	Grapes	33248	59110	0	0	0
107	Raisins	16177	0	0	0	0
108	Other Citrics		6000	0	0	0
109	India Figs		4400	0	0	0
110	Pistachio		9600	0	0	0
111	Bananas	10165		0	0	0
112	Others	9892	4200	0	0	0
113						
114	WINES	265694	1757942	1370440	0	109290
115	Must (000Hl)	265694	1725342	1167715	0	109290
116	Subproducts	0	32600	0	0	0
117	Cider (000Hl)	0	0	202725	0	0
118						
119	OLIVES	230206	356900	20000	0	0
120	Olive Oil (000Hl)	219436	349900	0	0	0
121	Olives	10770	7000	20000	0	0
122	Subproducts			0	0	0
123						

	A	M	N	O	P	Q
124		VALUE	IN	NATIONAL	CURRENCIES	
125	PRODUCTS					
126		SPAIN	ITALY	FRANCE	U.K.	GERMANY
127		000 PTA	000 LIRE	000 FF	000 L	000 M
128						
129	PASTURE & FORESTR	0	0	0	6777	0
130						
131	MEAT & DAIRY PROD					
132	MEAT	669329	1022913	2425252	88395	3591614
133	Beef & Veal	204861	509499	1376595	44598	1477328
134	Mutton & Lamb	110894	90603	254640	24197	82311
135	Goatmeat	31244		0	0	25496
136	Pigmeat	283802	386511	794017	19600	2006479
137	Rabbitmeat	38527	26300	0	0	0
138	Horsemeat		10000	0	0	0
139						
140	POULTRY & EGGS	182844	583347	1016000	12345	371109
141	Poultrymeat		165347	734000	3035	135709
142	Eggs		418000	282000	9310	235400
143						
144	MILK	306668	609745	1408000	48082	2810051
145	Cow	215078	477958	0	0	2690388
146	Sheep	11160	74490	0	0	0
147	Goat	80430	57297	0	0	119663
148						
149	HONEY	4522	3500	0	0	36520
150						
151	HORSES(000)	0	16000	0	2380	0
152						
153	Other Produce	0	22200	0	0	0
154						
155						
156	TOTAL	3842110	7836339	10935188	207180	10381868
157						